

A 9.6:109/cont+ind.

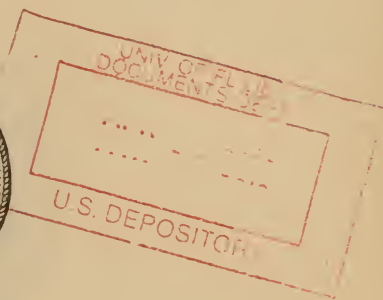
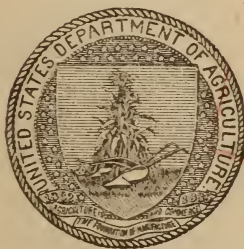
U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ENTOMOLOGY—BULLETIN No. 109.

L. O. HOWARD, Entomologist and Chief of Bureau.

PAPERS ON INSECTS AFFECTING
VÉGETABLES.

CONTENTS AND INDEX.

ISSUED SEPTEMBER 9, 1916.



WASHINGTON:
GOVERNMENT PRINTING OFFICE,
1916.

ADDITIONAL COPIES
OF THIS PUBLICATION MAY BE PROCURED FROM
THE SUPERINTENDENT OF DOCUMENTS
GOVERNMENT PRINTING OFFICE
WASHINGTON, D. C.
AT
5 CENTS PER COPY

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ENTOMOLOGY—BULLETIN No. 109.

L. O. HOWARD, Entomologist and Chief of Bureau.

PAPERS ON INSECTS AFFECTING VEGETABLES.

I. THE HAWAIIAN BEET WEBWORM.

By H. O. MARSH, *Agent, Engaged in Sugar-Beet and Truck-Crop Insect Investigations.*

II. THE SOUTHERN BEET WEBWORM.

By F. H. CHITTENDEN, *In Charge of Truck-Crop and Stored Product Insect Investigations.*

III. THE IMPORTED CABBAGE WEBWORM.

By F. H. CHITTENDEN, *In Charge of Truck-Crop and Stored Product Insect Investigations,* and H. O. MARSH, *Agent.*

IV. A LITTLE-KNOWN CUTWORM.

By F. H. CHITTENDEN, *In Charge of Truck-Crop and Stored Product Insect Investigations.*

V. ARSENITE OF ZINC AND LEAD CHROMATE AS REMEDIES
AGAINST THE COLORADO POTATO BEETLE.

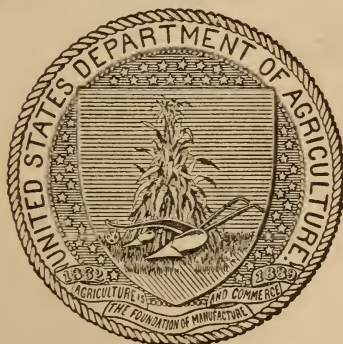
By FRED A. JOHNSTON, *Entomological Assistant.*

VI. THE SUGAR-BEET WEBWORM.

By H. O. MARSH, *Entomological Assistant.*

VII. THE HORSE-RADISH WEBWORM.

By H. O. MARSH, *Entomological Assistant.*



BUREAU OF ENTOMOLOGY.

L. O. HOWARD, *Entomologist and Chief of Bureau.*
C. L. MARLATT, *Entomologist and Assistant Chief of Bureau.*
E. B. O'LEARY, *Chief Clerk and Executive Assistant.*

F. H. CHITTENDEN, *in charge of truck crop and stored product insect investigations.*
A. D. HOPKINS, *Forest Entomologist.*
W. D. HUNTER, *in charge of southern field crop insect investigations.*
———, *in charge of cereal and forage insect investigations.*
A. L. QUAINANCE, *in charge of deciduous fruit insect investigations.*
E. F. PHILLIPS, *in charge of bee culture.*
A. F. BURGESS, *in charge of gipsy moth and brown-tail moth investigations.*
ROLLA P. CURRIE, *in charge of editorial work.*
MABEL COLCORD, *in charge of library.*

TRUCK CROP AND STORED PRODUCT INSECT INVESTIGATIONS.

F. H. CHITTENDEN, *Entomologist in charge.*

C. H. POPENOE, T. H. JONES, M. M. HIGH, F. A. JOHNSTON, AND D. E. FINK,
entomological assistants.
H. O. MARSH, F. B. MILLIKEN, C. F. STAHL, FRANK R. COLE, A. B. DUCKETT, B. L.
BOYDEN, R. E. CAMPBELL, W. H. WHITE, AND PAULINE M. JOHNSON, *Scientific*
assistants.
NEALE F. HOWARD, *Specialist.*
W. N. DOVENER, *Expert.*

CONTENTS.

	Page.
The Hawaiian beet webworm (<i>Hymenia fascialis</i> Cram.)..... <i>H. O. Marsh.</i>	1
Introductory.....	1
Food plants and injury.....	2
Life history and habits.....	3
Natural enemies.....	7
Experiments with insecticides.....	7
Description of the earlier stages..... <i>H. G. Dyar.</i>	11
Appendix..... <i>F. H. Chittenden.</i>	12
Description and synonymy.....	12
Distribution.....	14
History.....	14
Bibliography.....	15
The southern beet webworm (<i>Pachyzancla bipunctalis</i> Fab.)... <i>F. H. Chittenden.</i>	17
Injurious occurrences and notes on habits.....	17
Descriptive.....	19
The moth.....	19
The egg.....	20
The larva.....	20
The pupa.....	20
Distribution.....	21
Historical and biological notes.....	21
Natural enemies.....	21
Associated insects.....	21
Remedies.....	22
Paris green.....	22
"Dragging the log".....	22
The imported cabbage webworm (<i>Hellula undalis</i> Fab.)... <i>F. H. Chittenden</i> and <i>H. O. Marsh.</i>	23
Introduction, spread, and ravages.....	23
Description and life-history notes.....	27
The moth.....	27
The egg and oviposition.....	28
The newly hatched larva.....	29
The full-grown larva.....	29
The pupa.....	29
Distribution.....	30
Food plants.....	30
Natural enemies.....	31
The imported cabbage webworm in Hawaii.....	32
Life history and habits.....	34
Natural enemies in Hawaii.....	37
Experiments with insecticides.....	38
Experiment in screening a seed bed.....	41
Conclusion.....	41
Recommendations for control.....	42
Bibliography.....	44

	Page
A little-known cutworm (<i>Porosagrotis vetusta</i> Walk.).....F. H. Chittenden..	47
Injurious occurrence.....	47
Results from applications of arsenate of lead.....	49
Description.....	50
The moth.....	50
The larva.....	50
Distribution.....	50
Natural enemies.....	51
Arsenite of zinc and lead chromate as remedies against the Colorado potato beetle.....Fred A. Johnston..	53
Spraying experiments with arsenite of zinc and lead chromate in comparison with other arsenicals.....	53
Spraying experiments with arsenite of zinc of different strengths.....	55
A report of progress regarding the sugar-beet webworm (<i>Loxostege sticticalis</i> L.), H. O. Marsh..	57
Introduction.....	57
General appearance of the sugar-beet webworm and nature of attack.....	58
Life history and habits.....	59
Character of injury.....	61
Natural enemies.....	62
Other checks.....	63
Experiments with remedies.....	63
Spraying machinery.....	66
Cost of spraying.....	69
Conclusion.....	70
The horse-radish webworm (<i>Plutella armoracia</i> Busck).....H. O. Marsh..	71
Introduction.....	71
Occurrence in Colorado.....	71
General appearance and habits.....	72
Life history.....	73
Rearing records.....	73
Egg-laying record.....	75
Natural enemies.....	75
Experiments with insecticides.....	76
Recommendations for control.....	76
Conclusion.....	76
Index.....	77

ILLUSTRATIONS.

PLATE.

	Page.
PLATE I. Fig. 1.—Geared traction sprayer, suitable for the treatment of sugar beets against the Hawaiian beet webworm.....	8
Fig. 2.—Geared traction sprayer in operation in sugar-beet field.....	8

TEXT FIGURES.

FIG. 1. The Hawaiian beet webworm (<i>Hymenia fascialis</i>): Female moth.....	3
2. The Hawaiian beet webworm: Egg, larva, pupa, details.....	4
3. The southern beet webworm (<i>Pachyzancla bipunctalis</i>): Moth, larva, pupa, details.....	19
4. The imported cabbage webworm (<i>Hellula undalis</i>): Adult, larva, pupa.....	28
5. The imported cabbage webworm: Wing venation; head and antenna..	28
6. <i>Exorista pyste</i> , a parasite of the imported cabbage webworm.....	31
7. Small compressed-air sprayer.....	38
8. <i>Porosagrotis vetusta</i> : Moth, larva.....	50
9. The sugar-beet webworm (<i>Loxostege sticticalis</i>): Moth.....	58
10. The garden webworm (<i>Loxostege similalis</i>): Moth, larva, pupa, details..	58
11. A medium-sized sugar-beet plant defoliated by the sugar-beet webworm in July.....	60
12. Sugar beets defoliated by the sugar-beet webworm in July.....	61
13. Large sugar-beet plants, showing defoliation and weakened roots due to attack by the sugar-beet webworm in August.....	62
14. Field of young sugar beets destroyed by the sugar-beet webworm in June.....	63
15. Barrel sprayer suitable for use against the sugar-beet webworm.....	64
16. Barrel sprayer in action against the sugar-beet webworm.....	65
17. Four-row attachment for beet sprayer.....	67
18. Four-row attachment for beet sprayer.....	67
19. Four-row attachment for beet sprayer.....	67
20. Geared traction sprayer suitable for use against the sugar-beet webworm.....	68
21. Geared traction sprayer in action against the sugar-beet webworm.....	68
22. Filling a traction sprayer for spraying against the sugar-beet webworm..	69
23. Type of Vermorel nozzles suitable for spraying sugar beets against the sugar-beet webworm.....	69
24. The horse-radish webworm (<i>Plutella armoracia</i>): Adult or moth, side view and with wings spread.....	72
25. The horse-radish webworm: Larva, lateral and dorsal views.....	72
26. The horse-radish webworm: Pupa.....	73
27. The horse-radish webworm: Cocoon.....	73

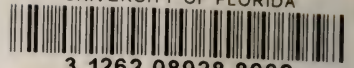
ERRATA.

Page 33, line 7, for *Agrostis* read *Agrotis*.

Page 72, line 14, for *scale like* read *scale-like*.

Page 76, last sentence, read, *In this garden the larvæ have evidently been prevented by a hymenopterous parasite from causing much damage, and at present no artificial control measures are necessary.*

UNIVERSITY OF FLORIDA



3 1262 08928 8962